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INFORMATION, TECHNOLOGY, AND THE CENTER OF GRAVITY
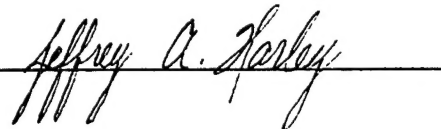
by

Jeffrey A. Harley
Lieutenant Commander, USN

As an Advanced Research Project

A paper submitted to the Director of the Advanced Research Department in the Center for Naval Warfare Studies in partial satisfaction of the requirements for the Master of Arts Degree in National Security and Strategic Studies.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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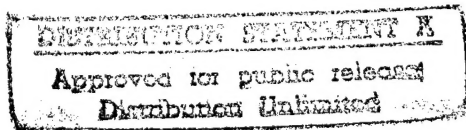
Paper directed by
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Director, Advanced Research Department
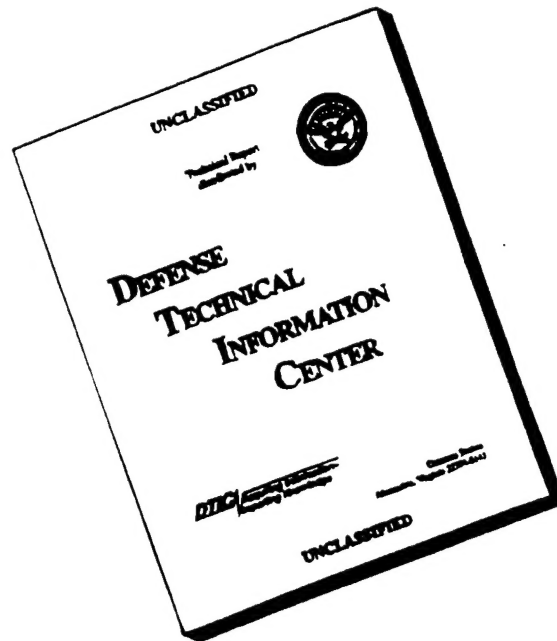and
Ernest J. King Chair of Maritime History

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Faculty Advisor   Date
Professor Michael I. Handel
Department of Strategy and Policy

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15. Abstract: The American "way of war" emphasizes overwhelming force and advanced technology. Unfortunately, these factors may not be decisive in every type of conflict. Information and technology remain tools with limitations that are not fully recognized. Information systems are enhancing command and control as well as target acquisition. However, reliance on these tools limits the opportunity for operational innovation and obscures the use of planning tools. The center of gravity concept is limited by service perceptions and differing definitions. Common understanding of these tools of war would enhance their utility and help the United States fight better in the future.

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PREFACE

My initial research stemmed from an interest in information warfare. I was intrigued by the range of literature that offered impossible goals such as total knowledge of the battlefield or the elimination of armies. I originally hoped to discover the role of information warfare as well as how the new technologies can be applied. This, however, led to the larger question of how an enemy can be targeted. Are we seeking to attack information, information systems, or the users of information? And what yields the greatest advantage? By definition, the answer to these questions should be the enemy's center of gravity. However, the value of a center of gravity is lost in the American way of war that emphasizes overwhelming force and technology in an effort to terminate a conflict quickly. Moreover, different definitions of the concept and competing service missions have also limited the value of the concept.

Unfortunately, America will not always face an inferior opponent. America may not always possess a technological advantage or technology may be unimportant in a particular type of conflict. As a result, the principal question becomes, "how can America fight better in future conflicts?" To answer this question, this study explores the tools of conducting and planning war. This study will examine information and technology as tools of *conducting* war. The concept of the center of gravity will be examined separately as a tool for *planning* war. The influence of technology upon the center of gravity concept and the potential of information as a center of gravity will also be explored.

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EXECUTIVE SUMMARY

The American way of war is characterized by overwhelming force and the use of advanced technologies. However, this style of warfare is not applicable or optimal in every type of conflict, as seen in the Vietnam War. Although technology has certainly enhanced many facets of conducting war, it remains a tool that is useful only in specific applications. In addition, the United States cannot be assured of overwhelming strength or technological advantage at the commencement of hostilities.

New information systems, however, are altering the methods of obtaining and disseminating information in a way that influences the conduct of military operations as well as command and control. Enhanced capabilities have improved target acquisition and the ability to attack the enemy's infrastructure. The changes that have occurred as a result of the growth in the information technologies are best seen as an extension of the role of information since the beginning of warfare. The role of information in warfare is as follows:

- Improved information integration can enhance the decision-making cycle by processing and distributing information faster so as to create an information differential that may potentially be exploited.

- Information, *if exploited*, continues to serve as a *force multiplier* through better allocation of potentially fewer forces and through the improved integration of information with ordnance on target.

In spite of the improvements in seeing, communicating, and integrating these with placing ordnance on target, there are limits to achieving the goal of information dominance. First, information exploitation remains a dynamic *process*. Information accumulation in and of itself is meaningless because the data must be evaluated and this

remains a human function fraught with great potential for error. Second, data collection and processing at the command level requires human filtering because of the sheer volume of data required to make a decision. Increased information flow to an operator in the field, or to a military commander, only increases the need for filtering the information, or worse, potentially overloads the decision-maker and possibly culminates in indecision, incomplete decisions, or incorrect judgments. Third, information is subject to manipulation or deception by the enemy. Information is not mere data--it has an *extracted value* which is subject to error and manipulation.

Information warfare is an outgrowth of increased information integration. At the military level, none of the methods or components are new. Outside military circles, however, information exploitation offers some new methods of shaping a conflict. In this way, information warfare techniques can transcend the traditional exploitation of information in the normal range of military operations and can include exploitation of political and economic infrastructures. Even so, there are distinct limitations on the exploitation of information in warfare:

- Information exploitation is a dynamic contest. The techniques may be applied by all parties to a conflict.

- The proliferation and availability of information technologies also limits planning due to improved surveillance and reconnaissance available to potential enemies.

Regardless of the amount of processing, level of automation, or degree of integration, information remains a *means* and not an end in itself. It does not serve as a center of gravity. In this light, information can be seen as a potential *intangible* or "soft" critical strength to be used against an ill-prepared opponent. More likely, it will be a

critical vulnerability of our opponent, reflecting a means to attack a genuine center of gravity such as armed forces. There are four characteristics of a center of gravity:

- A center of gravity is the principal source of strength.

- There is, ideally, only one center of gravity although there can be one at each level of war--tactical, operational, and strategic.

- The most important level of war normally depends on the nature of the war.

- A center of gravity is, in part, defined by one's strategic culture.

Unfortunately, different definitions of the center of gravity and differing service perceptions have limited the utility of the concept. To solve the problem, one can adopt a method that considers starting strength to determine whether one can directly attack the center of gravity or if one needs to strike critical vulnerabilities. From this, a suitable set of targets can then be developed.

Although the United States continues to possess a strong military and a technological advantage, the American way of war has limited future planning and execution of war. Planning has been limited by the availability of overwhelming force and technology. However, this style of war is not always successful. The United States must reconcile the role of information and technology in the way it conducts war. Above all, the *limitations* of information and technology need to be recognized and assessed in determining future structures. In addition, those who are *planning* war must recognize that the application of overwhelming force may not always be achieved. The United States needs to reconcile the utility of the center of gravity concept against the various definitions and service perceptions. This would enhance planning by resurfacing this lost analytical tool.

Therefore I say: 'Know the enemy and know yourself; in a hundred battles you will never be in peril.

When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal.

If ignorant both of your enemy and of yourself, you are certain in every battle to be in peril.'

—Sun Tzu

INTRODUCTION

THE AMERICAN WAY OF WAR

The art of war is simple enough. Find out where your enemy is. Get at him as soon as you can. Strike at him as hard as you can and as often as you can, and keep moving on.   ---Ulysses S. Grant

The American way of war is characterized by the use of overwhelming force and a search for technological advantage.[1] This appears to be a logical approach given the political need to limit the duration of a conflict and minimize casualties. This style of warfare, however, is not applicable to every type of conflict.[2] Although technology has certainly enhanced many facets of conducting war, it remains only a tool of war that is useful in certain applications. In addition, the United States cannot be assured of overwhelming strength or technological advantage at the commencement of hostilities.

New information systems, however, are altering the methods of obtaining and disseminating information in a way that influences the conduct of military operations as well as command and control. Enhanced capabilities have improved target acquisition and the ability to attack the enemy's infrastructure. As a result, the proliferation of technologies have led many to suggest the dawning of a revolution in military affairs brought about by the better integration of information.[3]

Clearly, the influence of information and technology have had an evolutionary influence on warfare and virtually every other aspect of our society. Sometimes in the

rush to exploit the new technologies, however, we lose sight of the other elements that create an advantage on the battlefield. Three elements--technology, ideas, and societal change--are the heart of true revolutions but they also, to a degree, represent a set of choices. The pursuit of technology has immense value as a force multiplier, however, it also can serve to limit the opportunity for the development of new ideas or societal change.

Unfortunately, the success of the United States in the Gulf War has reaffirmed the logic of the technological solution. The lessons of the Vietnam War have been lost in the desire to embrace success. What we should have learned in Vietnam is that America's technological advantage is not always decisive and that tactical success does not always ensure victory. More than anything else, however, the Vietnam war demonstrated a need to focus planning efforts.

One method to provide focus for planning is through the use of the center of gravity concept---defined in Department of Defense Dictionary of Military and Associated Terms as "those characteristics, capabilities, or localities from which a military force derives its freedom of action, physical strength, or will to fight."[4] Specifically, the Doctrine for Joint Operations suggests "the centers of gravity concept is useful as an analytical tool, while designing campaigns and operations to assist commanders and staffs in analyzing friendly and enemy sources of strength as well as weaknesses and vulnerabilities."[5]

Properly applied, the center of gravity concept can provide focus to planning efforts.[6] In the United States, however, the value of the concept has been lost in the drive

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to apply overwhelming force and because of different service missions and perceptions. In addition, the proliferation of information *technologies* has led to the suggestion that information itself is becoming a center of gravity. This has also confused the role of information and the application of the center of gravity concept. It is as if information has been transformed from a tool or means into an end in itself. As a result, military doctrine about the role of information technologies and the center of gravity concept is poorly understood and applied awkwardly, if at all.

The question to be examined, therefore, is "What can the United States do to fight better?" The answer is twofold. First, the *limitations* of information and technology as tools of war need to be recognized. Risks must be assessed in determining the future path to be pursued. Secondly, the *planning* of war must recognize that the application of overwhelming force may not always be possible. The utility of the center of gravity concept, as a means to focus planning, warrants further exploration.

Chapter 2 will explore the relationship between information and technology in warfare. Once this role is established, the concept of a center of gravity will be explored and developed in chapter 3. Chapter 3 will also explore the role of technology upon the center of gravity concept and will examine the role of information as a center of gravity. . In addition, a model to assist in the determination of a center of gravity will be offered. Chapter 4 concludes with a discussion of how better understanding of these concepts can help the United States fight better

NOTES

[1] For a historical analysis of the American "way of war," see Russell F. Weigley, <u>The American Way of War: A History of United States Military Strategy and Policy</u>. (Bloomington: Indiana University Press, 1977).

[2] Harry G. Summers, Jr., On Strategy: A Critical Analysis of the Vietnam War (New York: Dell Publishing, 1984), 177-179. Colonel Summers suggests that the United States failed to identify the North Vietnamese Army as the principal center of gravity and as a result lost the war. In his sequel on the Gulf War, the United States is credited with the correct identification of the Iraqi strengths and weaknesses. Unfortunately, any examination of the concept of a center of gravity suggests a potential analytical paradox. If you win the war, there is a tendency to assume all actions to be rational and correct. In the Gulf War, however, there were serious flaws in the method in which target lists were developed and in how the center of gravity was defined. In part this stems from inconsistencies in how the term is defined and how it is employed by the different services. Chapter three briefly explores the employment of targeting and the center of gravity concept in the Gulf War. Chapter three also explores a model to attempt to reconcile the different definitions of a center of gravity.

[3] Donald E. Ryan, Jr., "Implications of Information-Based Warfare," Joint Forces Quarterly n.s. 6 (Autumn/Winter 1994-95): 114.

[4] U.S. Office of the Joint Chiefs of Staff, Joint Chiefs of Staff Joint Publication 1-02, DOD Dictionary of Military and Associated Terms (Washington: 1994), 188.

[5] U.S. Office of the Joint Chiefs of Staff, JCS Joint Publication 3-0, Doctrine for Joint Operations (Washington: 1995), III-20.

[6] Timothy J. Keppler, "The Center of Gravity Concept: A Knowledge Engineering Approach to Improved Understanding and Application" an unpublished paper, U.S. Army Command and General Staff College, Fort Leavenworth, KS: June 1995, 45. In this thesis, Keppler developed common elements regarding centers of gravity which he used to develop an automated model called the U.S. Army War College "Center of Gravity Determination Assistant." This model uses knowledge engineering techniques to establish parameters for personal computer software.

CHAPTER I

TOOLS OF WAR

INFORMATION AND TECHNOLOGY

The first thing for a commander in chief to determine is what he is going to do, to see if he has the means to overcome the obstacles which the enemy can oppose to him, and, when he has decided, to do all he can to surmount them.   ---Napoleon

The rapid growth of information technologies and the promise of improved command and control have caused a reexamination of the role of information in warfare. The concept of attaining information dominance--that is , the ability to see, hear, and understand the enemy's command and control systems, intelligence sources, and sensors better than he undrstands ours[1]--has generated a type of warfare known as "information warfare."[2]

Although the limitations of the concept are still largely unexplored, information warfare can best be defined as "actions taken to achieve information superiority in support of a national military strategy by affecting adversary information and information systems.[3] It includes a military component--command and control warfare--but actually transcends military application. This definition also transcends other definitions of traditional military terms, such as intelligence defined as "information and knowledge about an adversary obtained through observation, investigation, analysis, or understanding."[4] Whereas

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intelligence is a process to *derive* knowledge, information warfare represents specific

offensive and defensive *actions* designed to exploit information. Specifically, information

warfare seeks to address a broader concept which integrates the elements of every facet of

modern warfare.

COMPONENTS OF INFORMATION WARFARE

Traditionally, "command and control warfare" is seen as the military component of

information warfare and consists of the five pillars of destruction, deception, electronic

warfare, psychological operations, and operational security. None of these elements,

however, represent a particularly new facet of war. They have been exercised in one form

or another for decades or, in some cases, centuries. Figure 1 is a representation of the

command and control warfare hierarchy.
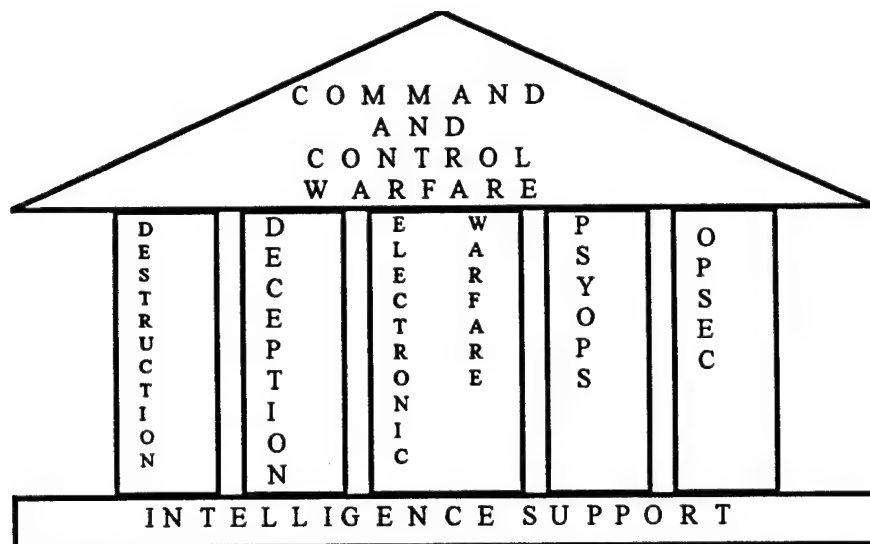
(Source: CJCS MOP 30)

Figure 1. COMPONENTS OF COMMAND AND CONTROL WARFARE.

In contrast to the components of command and control warfare, information warfare has a number of other components including intelligence-based warfare, electronic warfare, psychological operations, hacker warfare, economic information warfare, and cyber-warfare. Unfortunately, only certain elements of economic information warfare, hacker warfare, and cyber-warfare can be said to be new. The others are more likely extensions of existing capabilities.[5] They certainly do not alter the role of information as a means or a tool. In addition, the elements that are new are probably best employed prior to the start of a conflict. This suggests that they are not components of *warfare* and that their execution would likely be conducted by *non*-military agencies in an effort to either avoid or shape a potential conflict.

The question that emerges, however, is "What aspect of information exploitation has changed?" The answer lies in a potential Revolution in Military Affairs caused by the influence of the new technologies and advances in computer science and communications.[6]

MODELS OF INFORMATION REVOLUTION

Three principal models have emerged that attempt to explain the new role of information and information systems upon warfare. These models all suggest the existence of a new form of warfare as well as identify the influences that led to the change. Specifically, the three models suggest a historical progression that has created a new form of warfare as a consequence of a specific catalyst.

The first model, posed by Alvin and Heidi Toffler, suggests that information technologies comprise a revolution by creating a new Third-Wave of warfare based on

information, in contrast to the preceding "agricultural" and "industrial" waves. The Third Wave has the distinguishing characteristics of "brain-force," proliferation of technologies, non-lethal weapons, and knowledge-based warfare.[7] For the Tofflers, the type of warfare employed by a society directly reflects the means of making wealth. Their model suggests that since information is increasingly seen as the basis for wealth in a growing number of societies, it is natural that *information-based* warfare has evolved. The catalyst of change, therefore, is seen in the shifts in the economic base of society.

A similar model is the suggestion of a Fourth Generation of warfare proposed by William S. Lind et al. This model suggests that warfare in the modern era has progressed through three generations--the tactics of line and column (massed manpower), tactics of fire and movement (massed firepower), and nonlinear tactics of maneuver.[8] Instead of economic forces, the Lind model suggests that either technology <u>or</u> ideas serve to create generational shifts. The model suggests that there are elements of continuity that are likely to carry over into the Fourth Generation--particularly the goal of defeating the enemy from within instead of through physical destruction.[9] The most significant shift, however, occurs because Fourth Generation warfare accentuates the nonlinear nature of third generation warfare--that is, the distinction between war and peace will be further obscured and conflict that does occur will be dispersed over an even larger battlespace.[10] The potential for a *non-Western, idea-based generation*, including war that resembles terrorism, is seen as a possible alternative to the Western, technology-based Fourth Generation.

An extension of the Lind model is proposed by Thomas X. Hammes who suggests

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that a Fourth Generation has arrived but is not driven by technology or ideas. Rather, it is the synthesis of political, social, and economic changes.[11] Instead of Lind's vision of terrorist wars spawned by ideas, Hammes foresees a future of Netwars--defined as "societal-level conflicts waged in part through internetted modes of communications."[12] In this context, Netwar includes economic, political, and social forms of war. The distinguishing feature of this new type of conflict, however, is the specific targeting of information itself as well as communications systems.[13] Table 1 provides a summary of these information warfare models.

Table 1. MODELS OF INFORMATION REVOLUTION.

	TOFFLER	LIND ET AL	HAMMES
PRECEPT	MILITARY CHANGE PARALLELS WAY OF MAKING WEALTH	MILITARY CHANGE OCCURS WITH SHIFTS IN TECHNOLOGY OR IDEAS	MILITARY CHANGE OCCURS WITH SHIFTS IN SOCIETAL STRUCTURE
HISTORICAL PROGRESSION	WAVES: 1) AGRICULTURAL 2) INDUSTRIAL 3) INFORMATION	GENERATIONS: 1) MASSED MANPOWER 2) MASSED FIREPOWER 3) MANEUVER 4) TERRORISM-LIKE WARS	GENERATIONS: 1) MASSED MANPOWER 2) MASSED FIREPOWER 3) MANEUVER 4) NETWAR
DRIVERS OF CHANGE	INFORMATION BASED ECONOMY	TECHNOLOGY AND IDEAS	POLITICAL, ECONOMIC, AND SOCIAL FACTORS

Clearly, all three models suggest a revolution in warfare because of information integration but the changes are driven by different catalysts as perceived by the authors--technology, ideas, and societal change. The models recognize that all generations of warfare will continue to coexist. This is because technological transformation does not occur simultaneously. As a result, technological influences are spread over time and thus high-technology solutions may not be applicable in all forms of conflict. Information, therefore, *should not be seen as a "new" element* that overlaps the different waves of warfare but rather as an inherent component of any and all generations. The issue, however, is whether the technological changes in integrating information are revolutionary.

REVOLUTION OR EVOLUTION?

Although the defining criteria of a Revolution in Military Affairs varies, a revolution can be said to comprise four elements: technological change, systems development, operational innovation, and organizational adaptation.[14] The new information technologies reflect a high level of *technological change* and *systems development* and *can* have an operational impact, but this impact does not necessarily equate to an *operational innovation*. Clearly, the new technologies offer the capability to perform tasks *better* than in the past, but they still reflect limited change in the operational or tactical need to place ordnance on target.

In addition, *organizational adaptations* that do occur often lag technological innovations suggesting *enhanced capabilities* instead of revolutionary change. As we have seen, the new technologies enhance our locating, tracking, identifying, targeting, and destruction of targets over an increasing depth of battlespace. Revolution, however, is not just improved capability but rather "a recognition, over some relatively brief period, that the character of conflict has changed dramatically, requiring equally dramatic--if not radical changes in military doctrines and organizations."[15] To date, the information technologies have *not* yet achieved this level of operational innovation. Moreover, *organizational adaptation* also lags. This is due, in part, to the broad nature of the information techniques but more likely to a failure to recognize that the truly new capabilities lie outside of military circles. What, then, is the real role of information and information systems?

ROLE OF INFORMATION AND INFORMATION SYSTEMS

Technological changes do offer a number of significant enhancements. First, improved information integration enhances the decision-making cycle by processing and distributing information in a faster manner so as to create an advantage that can be exploited. Second, information serves as a *force multiplier* through better allocation of fewer forces and through improved target acquisition. The new systems provide improved knowledge of enemy hardware, troop concentrations, and environmental/terrain analysis. At the tactical and operational level, this real-time or near real-time information regarding troop and force movements may permit more timely and more appropriate offensive or

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defensive posturing to exploit enemy dispositions. Finally, as noted, information warfare techniques can also go beyond the traditional exploitation of information in the normal range of military operations and can include "information" attacks on political and economic infrastructures. This capability, or vulnerability, can only be expected to grow as more and more nations become linked via computer networks.

At the same time, however, it must be recognized that information exploitation is a dynamic contest between at least two sides. Consequently, the exploitation of information in mission planning is bounded in several ways. First, although information warfare techniques may permit the manipulation of the enemy perceptions, the same techniques may also be applied to United States' commanders and political leadership. Second, the rapid proliferation and availability of information technologies also limits planning and execution. Increased commercial and military availability of assets for surveillance and reconnaissance influence the ability to achieve surprise.[16] This limit implies that U.S. forces will increasingly be observed from space thereby limiting its ability to move large forces undetected, as the allied coalition did in Operation Desert Storm.[17] Finally, improved information connectivity and distribution increases the tension between operational security and effective planning. As integration increases, operational security decreases--pointing to the need to develop appropriate controls for the dissemination of information. Unfortunately, more emphasis has been placed upon the advantages gained by the technological advances in command and control systems while doctrinal concerns remain largely ignored.[18] Although the potential for exploiting information to improve our

knowledge of a potential enemy's material factors is improving, it has not altered the fundamental nature of war as a contest fraught with passions, friction, and uncertainty.

TECHNOLOGY RISKS

The United States continues to pursue a technological advantage that corresponds with its traditional way of war emphasizing low casualties and overwhelming force. However, there are a number of risks associated with a high reliance on technologies. This is not to suggest that the United States should not pursue technological advantage. It does suggest, however, the need to balance development against potential risks across the spectrum of military conflict.

Five principal risks can be identified. First, information technologies have expanded faster than the United States' understanding of the inherent vulnerabilities in the different networks and systems that bind more advanced nations.[19] The risk is that "...the threat to national security will most likely break free of traditional boundaries...[and] that a future adversary adept at information warfare might be able to cripple all the important financial, transportation, and communications functions of the US without even entering the country."[20] Clearly, there is a great deal more potential for disruption in the domestic and economic arenas than in the past.

Second, the vulnerability of technologically-dependent military organizations has also increased. In the last century, for example, information systems have become so pervasive and thus indispensable so that "modern militaries are utterly dependent upon [them] to maintain, deploy, and employ virtually every weapon system in their arsenals."[21]

For example, civilian networks, which now account for the vast majority of military communication, electrical power, and military transport, are increasingly vulnerable to damage or destruction.[22] Military organizations that become dependent upon information systems will also become more susceptible to information warfare techniques.

Third, increased emphasis on technology can lessen the United States' ability to fight in conflicts where technology has little application. In spite of the recognized value of new information technologies, low-technology countermeasures will continue to be developed. Low-technology forces can defeat high-technology ones as seen during the Vietnam War.

Fourth, increased technological dependence can directly undermine the effectiveness of current forces. The explosion of technology coupled with "the unique nature of many military systems has meant production lines have closed for many front-line weapons systems components. The loss of item manufacturers and material suppliers can affect a weapons system throughout its life-cycle, from design through operational use."[23] The lack of spare parts or increasing lead times to acquire spares can reduce the overall readiness of United States' forces.

Fifth, there is the danger of the technology gap closing. In part, this is because technological advances breed either duplication by the enemy or the creation of new or even better technologies to counter the previous advances. The ability to control proliferation of military technologies is eroding in favor of commercial components and systems.

Technological reliance is also increasingly affected by relative economic decline.
Decreasing economic strength already impacts military capabi' y by decreasing the
amount and types of weapons that can be purchased. This problem is made worse by the
natural spiral in the cost of advanced weapons in which there is a tendency to spending
larger amounts of money upon a smaller number of weapons.[24] At the same time,
technology also serves to place a "time-constraint' on the development of new weapons
systems and particularly on the speed with which they could be replaced in time of war. It
creates a circumstance in which military strategy must consider the existing order of battle
as well as the lengthy lead times required to build additional or replacement assets.

Even though information technologies act as a force multiplier, the question is
whether it is better to have a larger force that has less technology or a smaller force tied to
advanced technology. A larger force is more costly in terms of maintenance while a
smaller force requires large funds for technology and weapon procurement.[25] This
dilemma is evidenced by the crisis in finding funds to recapitalize United States' forces not
only for platforms but for other critical essentials, such as trucks for example, that remain
largely ignored. Understanding the role *and limitations* of information and technology is
more important than ever.

NOTES

[1] Owen E. Jensen, "Information Warfare: Principles of Third-Wave War," Airpower
Journal 8 (Winter 1994): 38.

[2] Marshall McLuhan, quoted in "Information Warfare: A Two-Edged Sword," RAND
Research Review (Fall 1995): 4.

[3] Department of Defense Directive S-3600.1 (Washington:1996) "Information Warfare.,"
offers this recently declassified definition of information warfare. This directive specifically notes
that command and control warfare is a subset of information warfare. A similar definition is
suggested by Milan N. Vego, "Operational Leadership" an unpublished paper, U.S. Naval War

College, Newport RI: July 1995, 11. He defines information warfare as "a series of actions conducted in support of national security strategy aimed to maintain a decisive advantage by attacking an adversary's information infrastructure through exploitation, denial, and influence, while protecting friendly information systems."

[4] U.S. Office of the Joint Chiefs of Staff, Joint Chiefs of Staff Joint Publication 1-02, DOD Dictionary of Military and Associated Terms (Washington, D.C.: 1994).

[5] Martin C. Libicki, What is Information Warfare?, (Washington, D.C.: National Defense University, 1995), 97.

[6] See, for example, Alvin Toffler and Heidi Toffler, War and Anti-War: Survival at the Dawn of the 21st Century (New York: Warner Books, 1993).

[7] Ibid.

[8] William S. Lind and others, "The Changing Face of War: Into the Fourth Generation," Marine Corps Gazette 73 (October 1989): 23.

[9] Ibid.

[10] Ibid.

[11] Thomas X. Hammes, "The Evolution of War: The Fourth Generation," Marine Corps Gazette 78 (September 1994): 35.

[12] John J. Arquilla and David F. Ronfeldt, "Cyberwar and Netwar: New Modes, Old Concepts, of Conflict," RAND Research Review (Fall 1995): 8. These authors provide the definition of Netwars and Cyberwars used by Hammes.

[13] Ibid., 9. As compared to Netwars, economic wars target the production and distribution of goods while political wars target leadership and government institutions.

[14] Andrew F. Krepinevich, "Cavalry to Computer: The Pattern of Military Revolutions," The National Interest (Fall 1994): 30.

[15] Ibid., 31.

[16] James R. Wolf, "Implications of Space-Based Observation," Military Review 74 (April 1994): 75.

[17] Ibid., 84.

[18] Jensen, 38.

[19] David C. Gompert, "Keeping Information Warfare in Perspective," RAND Research Review (Fall 1995): 6.

[20] John T. Correll, "Signs of a Revolution," Air Force Magazine 78 (August 1995): 2.

[21] Donald E. Ryan, Jr., "Implications of Information Based Warfare," Joint Force Quarterly n.s. 6 (Autumn-Winter 1994-1995): 114.

[22] "Information Warfare: A Two-Edged Sword," RAND Research Review (Fall 1995): 4.

[23] Defense Base Forecast, National Defense, October 1995, 5.

[24] Paul Kennedy, The Rise and Fall of the Great Powers (New York: Vintage Books, 1989), 522.

[25] Charles Swett, review of War and Anti-War by Alvin Toffler and Heidi Toffler, in Special Warfare 8 (Jan-uary 1995): 30.

CHAPTER II

TOOLS OF PLANNING

TARGETING AND THE CENTER OF GRAVITY

But war, though conditioned by the particular characteristics of states and their armed forces, must contain some more general -indeed, a universal-element with which every theorist ought above all to be concerned.
---Clausewitz

Information and technology continue to play a critical role in the conduct of warfare. In effect, they set limits as to how a conflict will be approached. Accurate information, coupled with the resources to deliver troops and material to a theater, has limited the need for planning. One planning tool that has been largely ignored is the center of gravity concept. As we have seen, the center of gravity concept is supposed to be a planning tool that offers a means to identify principal objectives at each level of war. Unfortunately, the complexities of modern warfare and confusion over the meaning of the concept have led to failures in its application. Moreover, the recent explosion of information technologies also served to confuse the meaning and application of the center of gravity concept.

CENTER OF GRAVITY ORIGINS

The concept of a center of gravity was originally stated by Carl Von

Clausewitz in <u>On War</u>.[1] He defined the concept when he suggested, "...one must keep

the dominant characteristics of both belligerents in mind. Out of these characteristics a

certain center of gravity develops, *the hub of all power and movement*, on which

everything depends. That is the point against which all our energies should be directed."[2]

As a critical concept, Clausewitz argued, "the first principle is that the ultimate substance

of enemy strength must be traced back to the fewest possible sources, and ideally to one

alone....The first task, then, in planning for a war is to identify the enemy's centers of

gravity, and if possible trace them back to a single one."[3] For Clausewitz, the principal or

single center of gravity was normally the army of the opposing nation. He clearly saw the

enemy's army as a the genuine source of power when he asserted, "Still, no matter what

the central feature of the enemy's power may be--the point on which your efforts must

converge--the defeat and destruction of his fighting force remains the best way to begin,

and in every case will be a very significant feature of the campaign."[4] Clausewitz also

suggested that armed forces, even divided ones, can be viewed as cohesive units. He

noted:

> The fighting forces of each belligerent--whether a single state or an alliance
> of states--have a certain unity and therefore some cohesion. Where there is
> cohesion, the analogy of the center of gravity can be applied. Thus, these
> forces will possess certain centers of gravity, which, by their movement and
> direction, govern the rest; and those centers of gravity will be found
> wherever the forces are most concentrated.[5]

Unfortunately, this emphasis on the armed forces, reflecting his operational perspective as

well as the historical environment in which he lived, has led to considerable confusion.

Although Clausewitz focused on armies, the comprehensive nature of his work suggested

other possible centers of gravity. These other centers of gravity were dependent upon the

nature of the conflict and the unique characteristics or aims of the belligerent nations.

Clausewitz wrote:

> We can now see that in war many roads lead to success, and that they do not all involve the opponent's outright defeat. They range from *the destruction of the enemy's forces, the conquest of his territory, to a temporary occupation or invasion, to projects with an immediate political purpose, and finally to passively awaiting the enemy's attacks*. Any one of these may be used to overcome the enemy's will: the choice depends on circumstances.[6]

Here Clausewitz transcended his environment and offered a conceptual framework for the

center of gravity that cuts across all levels of war---tactical, operational, and strategic.

For the most part, however, Clausewitz viewed the concept of center of gravity at the

operational level and not the strategic. Although the applicability of the concept at the

strategic level may be more strained and probably not in keeping with Clausewitz's desire

to avoid rigid principles, the concept still remains valuable as an analytical tool. He

cautioned, however, in Book VI, chapter 27, that his concept of center of gravity was not

yet fully developed and that his latter revisions would show how "this idea of a center of

gravity in the enemy's forces operates throughout the plan of war."[7] Specifically, then,

Clausewitz identifies the army, the capital, alliances (i.e., the nation with the larger army in

a coalition or the community of interest) and, in popular uprisings, the personalities of the

leaders and public opinion as potential centers of gravity.[8]

TECHNOLOGY AND THE CENTER OF GRAVITY

The advent of air power--with its prophets Giulio Douhet and Billy Mitchell--

created a technological influence which influenced the selection of targets and the center

of gravity. Air power theories suggest "air power is the primary weapon of this strategy because only it can provide the access, mass, persistence, and simultaneity of attack needed to induce paralysis."[9] Giulio Douhet, in his <u>Command of the Air,</u> written in 1921, argued that technology had altered the nature of warfare because the airplane offered a unique potential to bomb the enemy heartland. Douhet suggested that the principal role of aircraft had changed from aerial combat to one of precision bombing. He noted:

> We can see now...war is no longer fought in a series of scattered encounters, no matter how brave or skillful the participants may be. War today is fought by masses of men and machines. So this aerial knight-errantry ought to be supplanted by a real cavalry of the air...What determines victory in aerial warfare is [bomb] firepower.[10]

Technology, properly applied to the correct choice of targets, drove aerial strategy. Although Douhet does not offer prioritized objectives or targets that would compose a center of gravity, he offered cumulative physical destruction of ground targets as the means to defeat an enemy.[11] Douhet's rationale for this rested on his belief in the greater inherent offensive capabilities of air forces relative to army and navy competitors.

Like Douhet, American Billy Mitchell plotted a similar course for aviation in the United States. Unlike Douhet, however, Mitchell foresaw a continuing need for "pursuit" or fighter aircraft to engage in one on one aerial contests. Even so, Mitchell suggested the same role for aircraft--that is, a strategic bomber offering a unique means to hit enemy industrial capabilities. He noted:

> Heretofore, to reach the heart of a country and gain victory in war, the land armies had to be defeated in the field and a long process of successive military advances made against it. Broken railroad lines, blown up bridges, and destroyed roads necessitated months of hardships, the loss of thousands of lives, and untold wealth to accomplish. Now an attack from an air force using explosive bombs and gas may cause the complete evacuation of and cessation of industry in these places.[12]

Mitchell's vision forced a critical debate among the services in the United States--mostly because of his proclamation of the end of the battleship--but also because it forecast an end to large-scale mobilization of national resources to conduct warfare.[13] He foresaw the ability to avoid attrition warfare by overflying the ground battle to directly attack critical industries. In effect, the model offers two roles for air power; air power can be used to either attack the center of gravity directly or, if the center of gravity is not vulnerable, air power can be used indirectly to attack critical targets on the periphery in an effort to weaken the enemy further.[14] These peripheral targets thus assume a more strategic and operational significance since "the beauty of attacking each of these [critical factors] is that on the way to sequentially attacking the fielded army, destruction of enemy command or breaking of national will may cause early termination of the conflict at best, or at worst significantly weaken the army's ability to fight."[15]

Assuming some sort of strategic paralysis or disruption of the will to fight as a goal, this model assumes that each nation has vital targets or national elements of value (NEVs) which are more important than other factors in sustaining the capability or desire to fight; consequently, one should attempt to concentrate all air power resources against these vital targets.[16] Specifically, modern air power proponents suggest seven separate vital targets or NEVs: (1) leadership, (2) industry, (3) armed forces, (4) population, (5) transportation, (6) communications, and (7) alliances.[17] Moreover, these targets should be seen as dynamic and interrelated--that is, through the destruction or neutralization of the appropriate *mix* of these elements, one can induce paralysis or loss of political will upon an enemy.

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Another reflection of the influence of technology upon the center of gravity concept is the command and control model, sometimes called "inside-out" warfare. This model, developed by Colonel John A. Warden, was tested by his experience in developing targeting priorities during the Gulf War. This theory, like the air power model, also reflects the unique ability of aircraft to strike at targets other than just the opposing armed forces. Specifically, it suggests that all nations can be seen as a sort of system with five vital rings--command, essential production, transportation networks, population, and military forces. This model also suggests that all the rings individually are simultaneously part of the center of gravity and that they represent both strengths and weaknesses.[18] Figure 2 illustrates the five ring "center of gravity" theory.

(Source: John A. Warden, "Employing Air Power in the Twenty-First Century")
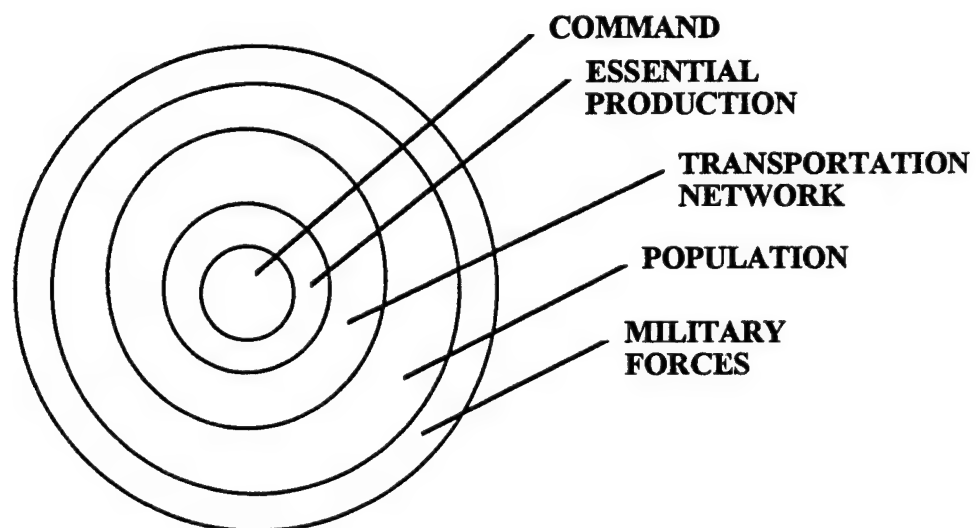

Figure 2. FIVE RING THEORY.

Although the level of development of the different rings may vary, air power allows one to strike at each ring without necessarily hitting the enemy armed forces. Even though this theory acknowledges that defeat of a nation's armed forces may make all of the other rings vulnerable, it proposes that it is best to attack all of the rings simultaneously. Unfortunately, this model tends to ignore the purpose of a center of gravity as a planning tool to concentrate on one critical aspect and simply imposes technology atop a targeting plan.

INFORMATION AS A CENTER OF GRAVITY

The enhanced role of information has led some theorists to suggest that information itself has become a center of gravity. Proponents of the Five Ring theory, described above, as well as proponents of systems analysis, specifically suggest that information can become a center of gravity.

The command and control model views information as a center of gravity by equating information itself with information users (i.e., command and control). This model specifically suggests that leadership or command and control *is always* the principal center of gravity.[19] According to the Five Ring Theory, the enemy command structure is the most critical element because leaders are the only individuals in a country that can negotiate or make concessions.[20] Although this perception of the *role* of the enemy command (i.e., to direct forces) is correct, it misses the critical link between the use of force and the political goal of a nation--namely to "compel our enemy to do our will" which is normally through attainment of a *tangible* objective--be it defeat of armed forces,

taking of territory, or seizure of possessions.[21] Certainly, intangible factors, such as the will of the leadership, can be influenced by attacks on the enemy command and control elements, but are most often achieved in one of the tangible ways mentioned above.

In addition, attacking the command structure itself poses a number of significant difficulties, assuming one knows the precise location of the enemy leadership in the first place. First, strategies that attempt physical decapitation of the political leadership as their main means to achieve the end of a conflict can only work if there is no one who will fill the enemy leadership void after the removal of the serving leadership. Arguably, the number of instances are limited where a specific individual or group of individuals are so tied to the war effort that their death or removal would cause certain defeat.[22] The removal of a given leader may be desirable, but this could result in an even more fanatical leadership.

Second, decapitation of the leadership elements may even serve to perpetuate the conflict through anarchy. If no one steps in to fill the leadership void, what legitimacy can exist to negotiate and to terminate the war? And with whom do you negotiate? These tragic circumstances perpetuated the Franco-Prussian War when the capture of Napoleon III complicated Bismarck's efforts to end that war. On the other hand, decapitation can perpetuate the war through creation of a more politically viable regime within the enemy country. For example, the French seizure of Front de Liberation Nationale (FLN) leadership during the Algerian insurgency served only to reinforce FLN support while creating a new leadership better able to reassess the static operations in Algeria. In the end, the new FLN leadership created a more effective strategy against the French.

Third, the implication that communications nodes should *always* be attacked is also unwarranted. It has been suggested that although it is now more difficult to capture or kill the command element, command communications have become increasingly important and these are more vulnerable to attack.[23] In Operation Desert Storm, for example, the ultimate destruction of Iraqi ground forces was achieved through "paralyzing its central nervous system--that is, C4I [command, control, communications, computers, and intelligence] links."[24] This may be true, but disruption of enemy communications can also prove counterproductive if the communications are yielding valuable intelligence, or if the enemy is able to resort to communications that are not susceptible to monitoring activities. This is not to say that attacks on command and control elements may not be beneficial or desirable, but rather that they should be considered in light of other factors. As it stands now, the concept of attacking command and control has erroneously become nearly doctrinal in nature.

Finally, the nature of the conflict must also be considered. Attacks on enemy command and control elements may not be possible at all when such attacks would also impact friendly or host nation forces--such as during a counterinsurgency operation.

Another theory of war examines the center of gravity at a systems level. Like the command and control model, the enemy is viewed as a system.[25] Instead of emphasizing the components of state systems, however, this model seeks to explain victory in terms of information dominance. Clearly, the domination of information has always been important, but this theory suggests that the changes in information processing and targeting "have now converged to enable [information] to achieve overarching effects in

the realm of conflict."[26] This model also suggests that greater informational connectivity permits the exploitation of the remaining military, its infrastructure, and ties to other sub-systems.[27] Using a systems approach focusing on information systems, this theory suggests information dominance can be achieved. If one examines nations as entities that attack components of their enemy, then information becomes a vital component on which the outcome of a conflict depends. The implication is that through information dominance, such as that used to turn the tide of the Battle of the Atlantic through the exploitation of cryptologic systems like ULTRA, information becomes an entity in itself and can thus be targeted and exploited.

The point being missed, however, is that the exploitation of these types of information have always been a part of warfare. There may be value in recognizing that increased connectivity may, in theory, make exploitation of information easier but this does not indicate something new in the fundamental role of information. In addition, information in this role still does not meet the defining characteristics of causing cascading failure or leaving forces incapable of continuing their efforts. The exploitation of information can severely hamper the efforts of the enemy but victory is not achieved by defeating his information but by beating his armed forces.

CHARACTERISTICS OF A CENTER OF GRAVITY

Although the center of gravity concept has been influenced by information systems and technology, the value of the center of gravity concept still lies in its ability to focus planning efforts. One's initial capabilities also influence how the concept is applied. If

one is strong, the ability to attack the enemy's center of gravity becomes a viable option, thus offering a shorter path to victory. If one is weak, attacking the enemy's center of gravity is fruitless and most likely debilitating. Thus, attacking weaknesses may ultimately shift the balance until one is indeed able to attack the center of gravity of the enemy. In either case, the center of gravity remains a strength, but the path to damaging an enemy's center of gravity may be direct or indirect depending upon relative force strengths. The *first characteristic of a center of gravity, then, is that it remains the principal strength.* If successfully attacked, a weakened or destroyed center of gravity must cause a debilitating ability to continue the conflict or a cascading failure that leads to capitulation. The air power model and the command and control model reviewed above reflect the imposition of technology upon the center of gravity concept. In these models, aircraft are employed to attack strategic and operational targets which, ideally, lead to the collapse of the center of gravity.[28]

Although the theories suggest that the center of gravity may be either single or many, ideally, the *second characteristic of a center of gravity is that there is only one.* There can be, however, a different center of gravity at each level of war.[29] In a traditional democratic system, for example, one might expect the will of the people or the cohesion of a coalition to serve as the *strategic* center of gravity while operational and tactical centers of gravity would most likely be military forces or supporting infrastructure.[30] In addition, the center of gravity, although singular, is subject to change as an operation unfolds or as the dynamic interaction between opposing forces alters the corresponding strengths and capabilities. For example, prior to an amphibious landing the amphibious task force may

represent the center of gravity because the destruction or neutralization of that force may preclude further hostile action and force capitulation. Once the ground forces are ashore, however, the center of gravity most likely shifts to the ground troops since the loss of the shipping, although valuable, does not necessarily cause a cascading failure or carry the value of precluding further actions.

The *third characteristic of a center of gravity is that the most important center of gravity for a given level of war normally depends on the nature of the war itself.* A war of attrition, or wars with prolonged duration, tend to de-emphasize tactical or operational success (e.g., Vietnam) while wars of lesser duration tend to de-emphasize a strategic center of gravity (since the strategic gravity is more attainable through achieving operational success).[31]

A fourth characteristic of centers of gravity is that they are partially limited or defined by strategy. The level of technology, degree of doctrinal adaptation, and societal values--such as acceptance of casualties versus risk aversion or more democratic norms versus totalitarian principles--impact the validity of a center of gravity but also influence its selection. For the United States, aversion to casualties and fear of prolonged conflicts culminates in a greater emphasis on technology and decreasing willingness to commit forces to operations not deemed in the vital interest.[32] Technology also affects the nature of a war and bounds the means to attack the center of gravity while ideological values can also impact the viability of a potential center of gravity. A totalitarian regime accustomed to public support, for example, is not as susceptible to attacks on the will of the people or public morale.[33]

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In summary, a center of gravity should be a main source of power or strength which, if attacked, causes such a debilitating effect as to terminate the war. Even if the command and control functions of an opponent are crippled, one still has to defeat the opponent's armed forces. This suggests that information will remain in its historical context as a means or tool, but not as an end to be conquered. As a result, information can potentially be a critical strength (if one side can dominate information) or, more likely, a critical vulnerability (by creating an indirect path to an opponent's center of gravity).

NOTES

[1] The most comprehensive examination of Clausewitz can be found in Michael I. Handel, Masters of War: Sun Tzu, Clausewitz and Jomini (London: Frank Cass, 1992).

[2] Carl Von Clausewitz, On War, Michael Howard and Peter Paret, eds. and trans. (Princeton: Princeton University Press, 1984), 595-596. Italics added.

[3] Ibid., 617-619.

[4] Ibid., 596.

[5] Ibid., 485-486.

[6] Ibid., 94.

[7] Ibid., 486.

[8] Ibid., 596.

[9] Jason B. Barlow, "Strategic Paralysis: An Air Power Strategy for the Present," Airpower Journal 7 (Winter 1993): 5.

[10] Giulio Douhet, The Command of the Air, trans. Dino Ferrari (New York: Coward-McCann, 1942), 43-44.

[11] Ibid, 51.

[12] William Mitchell, Winged Defense (New York: G.P. Putnam's Sons, 1925), 5-6.

[13] Ibid., 8-9.

[14] Thomas A. McCarthy, "Air Power and the Center of Gravity" an unpublished paper, U.S. Naval War College, Newport RI: June 1995, 3.

[15] Ibid., 9.

[16] Barlow, 9.

[17] Ibid., 10.

[18] John A. Warden, "Employing Air Power in the Twenty-First Century," The Future of Air Power in the Aftermath of the Gulf War, Richard H. Shultz, Jr., and Robert L. Pfaltzgraff, Jr., eds., (Maxwell AFB, AL: Air University Press, 1992), 64.

[19] Ibid., 65.

[20] Ibid, 65.

[21] Clausewitz, 101.

[22] Steven Metz and Frederick M. Downey, "Centers of Gravity and Strategic Planning," Military Review 68 (April 1988): 30.

[23] Warden, 65.

[24] Donald E. Ryan, Jr., "Implications of Information-Based Warfare," Joint Forces Quarterly n.s. 6 (Autumn/Winter 1994-95): 114.

[25] John Arquilla, "The Strategic Implications of Information Dominance," Strategic Review 22 (Summer 1994): 28. Professor Arquilla suggests that when systemic elements are analyzed, "a practical approach to employing information dominance against centers of gravity suggests itself."

[26] Ibid., 27.

[27] Arquilla, 28.

[28] It can also be argued that the technological nature of modern war often requires indirect attacks first to first gain air superiority, since "the enabler for all subsequent missions, be they air missions or ground missions, is air superiority . See, for example, Thomas A. McCarthy, "Air Power and the Center of Gravity" an unpublished paper, U.S. Naval War College, Newport RI: June 1995, 10.

[29] Lisa Bennett and Bruce Niedrauer, "Center of Gravity," Military Intelligence Professional Bulletin (April-June 1995): 25. The authors express a similar concept when they suggest "The nature of a center of gravity may vary. At the national level the center of gravity is often abstract. It may be national will and public opinion, key individuals, massed armor or artillery units, specific elite units, or air or naval power." My suggestion, however, is that there is one center of gravity per level of war.

[30] William W. Mendel and Lamar Tooke, "Operational Logic: Selecting the Center of Gravity," Military Review 73 (June 1993): 5. The authors suggest that "Aims or objectives established at the operational or tactical levels should contribute to our ability to impose or will (such as destroy, defeat or delay) over the center of gravity at the next higher level of war." I agree with this as an ideal but suggest that this is highly dependent upon the nature of the conflict.

[31] In Book one, Chapter two (p. 92) of On War, Clausewitz observes, "since war is not an act of senseless passion but is controlled by its political object, the value of this object must determine the sacrifices to be made for it in *magnitude* and also in *duration*. Once the expenditure of effort exceeds the value of the political object, the object must be renounced and peace must follow." This suggests that there are only two ways to modify the commitment to a political objective. One can increase the amount of force employed vis-à-vis an opponent or one can commit to a prolongation of a conflict in an effort to achieve to achieve advantage at a later time.

[32] An outgrowth of the Vietnam War was the development of the Weinberger Doctrine which establishes specific requirements to consider prior to committing to the use of force.

[33] Metz, 29.

CHAPTER III

THE MISPLACED TOOL

PLANNING AND THE CONCEPT OF THE CENTER OF GRAVITY

Nothing is more important in life than finding the right standpoint for seeing and judging events, and then adhering to it. One point and one only yields an integrated view of all phenomena; and only by holding to that point of view can one avoid inconsistency.   ---Clausewitz

As we have seen, the ability to employ overwhelming force and achieve technological advantage may not be applicable in every conflict. The center of gravity concept, however, can help provide a useful analytical tool when the traditional American way of war is not practical. Unfortunately, different service perceptions and the tendency to "re-fight the last war" continue to obscure the utility of the concept.

SERVICE PERCEPTIONS

Different missions of the individual services also obscure the utility of the center of gravity concept. For example, since the United States Marine Corps is a smaller force accustomed to "forced entry" into a theater, they naturally choose to attack where the enemy is weak. Thus, whereas the United States Army views the center of gravity as a strength, the Marine Corps concludes it is a weakness.[1] The Marine Corps, for instance, suggests the employment of the concept of a center of gravity is actually dangerous:

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Clearly, Clausewitz was advocating climactic test of strength against strength "by daring all to win all.". This approach is consistent with Clausewitz' historical perspective. But we have since come to prefer pitting strength against weakness. Applying the term to modern warfare, we must make it clear that *by the enemy's center of gravity we do not mean a source of strength, but rather a critical vulnerability.*[2]

Not surprisingly, the United States Navy, with an increased emphasis on littoral warfare, adopts the perspective of the center of gravity as a source of strength, but applies the concept in a manner tied to the Marine Corps. Navy doctrine advocates seeking "opportunities to access and destroy a center of gravity" through striking critical vulnerabilities.[3] In contrast, the United States Air Force asserts that "successful strategic attack operations depend on proper identification of the enemy's major vulnerabilities-- centers of gravity."[4] With a more strategic outlook than that of the other services, the Air Force adopts targeting priorities established by John Warden's Five Ring Theory. The Basic Aerospace Doctrine notes:

> Against a modern industrialized opponent in a conventional or nuclear war, a center of gravity may be discerned by a careful analysis of the enemy's infrastructure, logistics system, population centers, and command and control apparatus. Against a less industrialized opponent, a center of gravity may be subtle--it could, for example, be the political or materiel support the enemy obtains from noncombatant allies.[5]

As a result, the Air Force tends to adopt the notion of multiple centers of gravity with targeting categories serving as "centers" of gravity.

FIGHTING THE LAST WAR

A second factor that obscures the utility of the center of gravity concept is the tendency to prepare to re-fight the last war. For instance, the Gulf War clearly

demonstrated the advantage of improved integration of weapons and sensors. At the same time, the exposure of the American public and media to only high-technology warfighting reinforced an aversion to casualties and a reliance on technology that may not be appropriate in all future conflicts. The danger in perpetuating this war as a blueprint for future conflicts is that it reinforces a growing perception that war can be a near bloodless event. For example, the incredible video footage of singular missiles striking doorways or ventilation shafts not only belied the human cost, but was also not representative of the war fought off-camera. In fact, only 6.2 percent of the munitions used in the Kuwaiti Theater of Operations in Operation Desert Storm were precision guided.[6]

There are also a number of other reasons why the Gulf War may not be typical of future wars including an unusual world consensus, Iraq's passive defense, the lack of a balanced air-ground-naval adversary, and an unusually good support infrastructure for the coalition.[7] This last is perhaps most critical; without the six months to get enough soldiers, munitions, and other supplies into theater as well as Saudi Arabia's superb air facilities and seaport accessibility, the Iraqi armed forces may have been able to successfully invade Saudi Arabia thereby changing the very nature--and potential costs--of the war.[8]

Unfortunately, the confused role of a center of gravity culminated in a planning method that was not optimal. In the Gulf War, for example, the centers of gravity were designated as (1) leadership and command and control, (2) chemical, biological, and nuclear capability; and (3) forces of the Republican Guard.[9] However, the objectives were not prioritized based on designation as centers of gravity but instead were allocated to

specific phases based upon campaign objectives.[10] In other words, the targeting took

place *prior* to selection of a viable center of gravity. As a result, the objectives were

apparently not analyzed in terms of being the principal strength or as an element which

could cause cascading failure even though they were listed as strategic targets.

CENTER OF GRAVITY DECISION MODELS

Clearly, the application of the center of gravity concept is confused by different

service perceptions and the tendency to re-fight the last war. The question of how to

apply the concept is similarly confused. William W. Mendel and Lamar Tooke address the

question of selecting a center of gravity by developing a test of validity and feasibility.[11]

Figure 3 represents a flow chart for testing these two criteria.
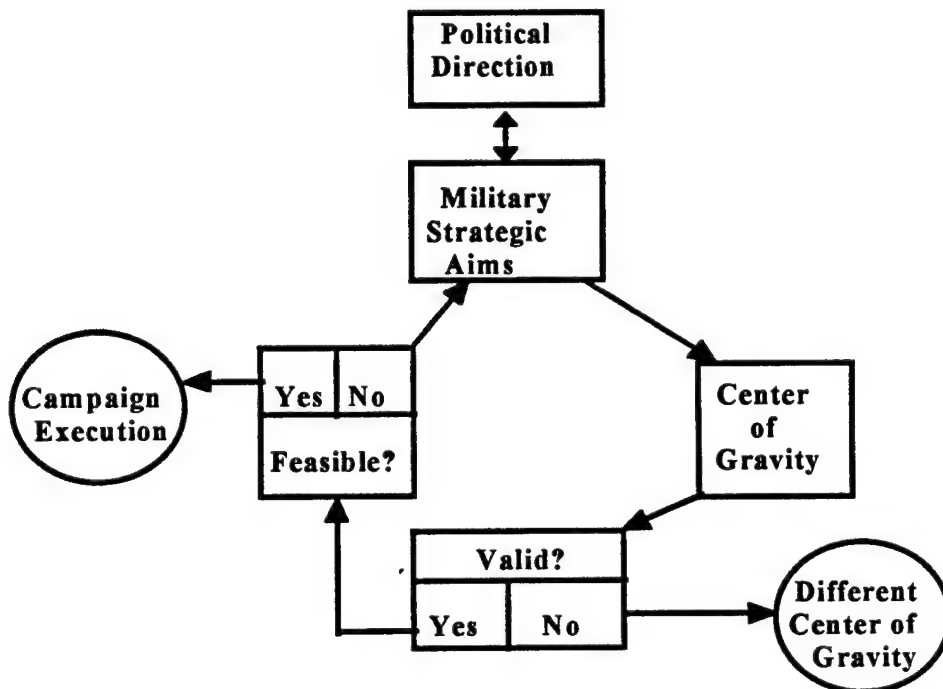
(Used with permission of William W. Mendel and Military Review, June 1993)

Figure 3. MENDEL-TOOKE METHOD.

This model suggests that a potential center of gravity should be tested against the criteria of whether the imposition of one's will over the center of gravity creates a "deteriorating effect that prevents our foe from achieving his aims and allows the achievement of our aims."[12] Feasibility, on the other hand, reflects the ability to impose one's will over the center of gravity---that is, military capability.

The Mendel-Tooke model demonstrates a framework for selecting an operational center of gravity, but the issues of differ definitions, service missions, and target development remain unresolved. One a ach to reconcile this problem is to both integrate the various service perspectives and recognize the potential need for an more indirect approach. In addition, the relationship between the center of gravity and target development could also be developed int a flow chart. Such an approach is demonstrated in figure 4.
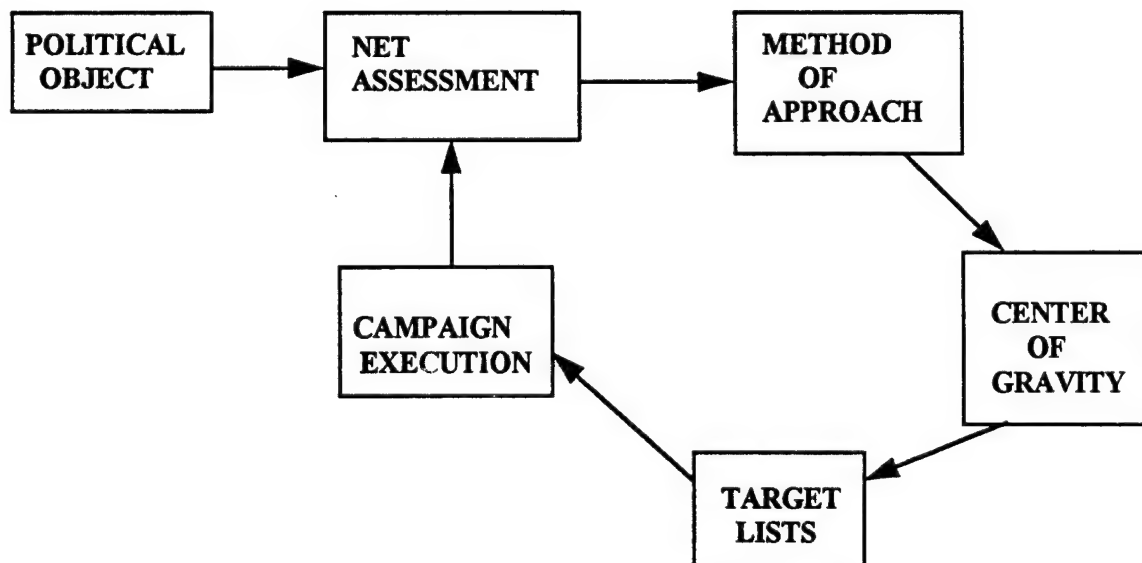
Figure 4. CENTER OF GRAVITY FLOW CHART.

A traditional net assessment between forces thus provides a starting point in determining a campaign or operational plan. The net assessment provides a decision whether initial strength or capabilities permits attacking the enemy center of gravity directly. If one does not have the strength to attack the center of gravity directly, then an indirect path to the center of gravity through attacking critical vulnerabilities can be used. Once it has been determined whether to attack the center of gravity or critical vulnerabilities, then target lists can be developed to assist in campaign execution. Since campaign execution affects the relative strengths and capabilities of both forces in a conflict, the chart calls for continuous assessment which starts the cycle over.

Adoption of this method serves to address the different service perspectives but also reflects the anticipated initial strength of the forces. It incorporates the innovative Mendel-Tooke concept of a feasibility test by including strategy aims as part of the net assessment and by reflecting initial strength in the approach method. It also expands the concept of a validity test by aligning the determination of the center of gravity followed by creation of target lists. Finally, it reflects the need to continually reassess net force capabilities in order to allow a modification of approach and changing center of gravity, if required or desirable.

NOTES

[1] See U.S. Army Field Manual 100-5, Operations, compared to U.S. Marine Corps FMFM 1 Warfighting. FM 100-5 asserts "The center of gravity is the hub of all power and movement upon which everything depends. It is that characteristic, capability, or location from which enemy and friendly forces derive their freedom of action, physical strength, or will to fight. The essence of operational art lies in being able to mass effects against the enemy's main source of power--his center of gravity, which he seeks to protect." In addition FM 100-5 suggests, "At any given time, however, a center of gravity may not be immediately discernible. For example, the center of

gravity might concern the mass of enemy units, but that mass might not yet be formed. Additionally, the center of gravity may be abstract such as the enemy's national will or an alliance structure, or concrete, such as strategic reserves, or industrial bases and LOCs."

[2] U.S. Marine Corps FMFM, Warfighting, (Washington: March 1989), 85 (endnote 28, italics added).

[3] Department of the Navy, Naval Doctrine Publication 1, Naval Warfare, (Washington: March 1994), 35.

[4] Department of the Air Force, Air Force Manual 1-1, Vol. II, Basic Aerospace Doctrine of the United States Air Force, (Washington: March 1992), 151.

[5] See Department of the Air Force, Air Force Manual 1-1, Vol. II, Basic Aerospace Doctrine of the United States Air Force, (Washington: March 1992), 151. The Basic Aerospace Doctrine cites Col John A. Warden III, The Air Campaign: Planning for Combat (Washington, D.C.: National Defense University Press, 1988) 40-59.

[6] Eliot A. Cohen, dir., Gulf War Air Power Survey, Vol. II Part 2, Washington, D.C.: 1993, 206. Of the total of 222,479 munitions used in the Kuwaiti Theater of Operation, only 12,854 were precision guided. In addition, of this small number of precision guided munitions, a significant portion (AGM 114 Hellfire for instance) were likely employed in tactical roles thereby further decreasing the percentage of smart weapons employed in a strategic capacity.

[7] H.C. Zeigler, "Lessons Learned from the Gulf War" an unpublished paper, U.S. Naval War College, Newport RI: 1992.

[8] Robert Denny, "America's Might in the Gulf War," Retired Officer Magazine, February 1996, 35.

[9] Cohen, Vol II Part 2, 79.

[10] Ibid., Vol II Part 2, 78-79. The Centers of Gravity and Operational Campaign Objectives were originally specified in the Combined Operations Plan for Offensive Operations to Eject Iraqi Forces from Kuwait and the secret U.S.-only document, USCINCCENT OPORD 91-001. The Operational Campaign Objectives are listed as:

1. Destroy Iraq's military capability to wage war (listed in OPORD 91-001 as "Attack Iraqi Political/Military Leadership and Command and Control")
2. Gain and maintain air supremacy (OPORD 91-001 replaces supremacy with "superiority.")
3. Cut Iraqi supply lines.
4. Destroy Iraq's chemical, biological, and nuclear capability.
5. Destroy Republican Guard Forces.
6. Liberate Kuwait City with Arab Forces.

[11] William W. Mendel and Lamar Tooke, "Operational Logic: Selecting the Center of Gravity," Military Review 73 (June 1993): 5.

[12] Mendel, 5.

CHAPTER IV

FIGHTING BETTER

RECOMMENDATIONS AND CONCLUSION

The object in war is to attain a better peace—even if only from your own point of view. Hence it is essential to conduct war with constant regard to the peace you desire.   ---B. H. Liddell Hart

The American way of war relies on information exploitation and advanced technology. The tools of information and technology are used to help reduce the complexity of war. However, the limitations of these tools in all types of conflicts must be considered. As we saw in the last chapter, there are a number of factors that limit effective planning. This, in part, can be overcome by understanding the role of a center of gravity. Unfortunately, there is a tendency to confuse the role of information in warfare and overestimate the value of technology. To understand how the United States can fight better in future wars, it must understand the influence of these tools on command and control and in the conduct of war.

IMPLICATIONS FOR COMMANDERS

The role of information itself is unchanging although improved integration of information has enhanced some aspects of decision-making and target acquisition. The new information systems have greatly influenced command and control. There is a

growing need for improved systems and methods to monitor and control information flow at the appropriate warfare levels. The complexity and quantity of information already requires a certain level of processing that turns data into usable information. The sheer quantity of information that can be expected by an operational commander will amplify the need for additional filters because of the limited capacity of any commander to assimilate the information available.[1] This ability will be clearly dependent upon the intellectual capability and personality of the commander and his staff but future systems must serve to better integrate information, instead of simply promoting additional analysis for a given staff to present to the commander.[2] Unfortunately, any filtering system involves setting limits as to what will be seen and what will be given to other levels for review or analysis; this creates the danger of overwhelming other links in the chain of command or potentially depriving them of information which may be critical for their mission. Given these constraints, the key remains to not merely make all information available, but to develop a means to appropriately compartmentalize the information required for a given level of warfare.

In addition, the United States must recognize the change in command relationships created by new communications capabilities. One of the principal tenets of command is centralized control but de-centralized execution. New information technologies, however, are unintentionally eroding this relationship. Senior commanders will be increasingly tempted to interfere in lower-echelon decisions because they now have an enhanced real time picture of the battlefield. Another possible effect of this phenomena may be the stifling of initiative in subordinate commanders. Even if a

subordinate is not required to coordinate the details of a mission with his senior

commander, he may be inclined to do so simply because the communications means are

available. This could compromise his initiative and undermine the effectiveness of his

command.

IMPLICATIONS FOR THE FUTURE

A second factor that limits the United States' ability to fight better is an increasing

reliance on technology. The risks of technology--including increased vulnerability,

decreased effectiveness of existing forces, and risks of technological proliferation--must

be balanced against decreasing defense budgets and applicability in future conflicts.

There continues to be a need to fight in a variety of conflict types. Ongoing debate must

continue regarding the relevance and cost of future programs and platforms.

To fully exploit the new technologies that are developed, including information

warfare systems, the United States must develop an *integrated* doctrine which is

accessible and which are adaptable for training purposes. In addition, systems

development requires continued standardization and greater emphasis on information

security and counter-command and control techniques. As a result, emphasis should be

placed on security and redundancy during the development and integration of information

systems.

Information warfare, an outgrowth of information integration, also offers the

promise of improved capabilities. However, the role of information exploitation is limited

by the dynamic nature of war and because the new technologies fall outside of military

circles. As a result, coordination between the Department of Defense and those agencies that will likely execute information warfare needs to be developed. Figure 5 represents a simplified method of determining whether information warfare or exploitation should be used.
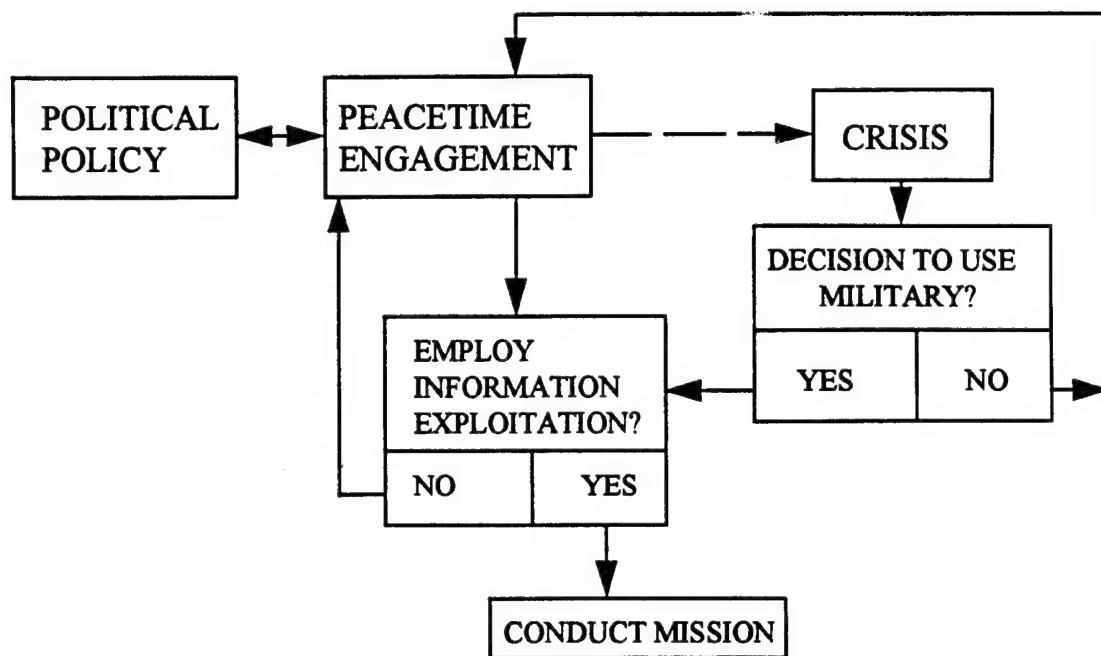

Figure 5. DECISION CHART FOR INFORMATION EXPLOITATION.

This chart indicates the need for an ongoing assessment as to whether to apply information warfare techniques and addresses the need to appropriately select an agency for execution of mission if selected.

CONCLUSION

Although the United States continues to possess a strong military and a technological advantage, the American way of war has limited future planning and

execution of war. Planning has been thwarted by the availability of overwhelming force and technology. However, as we have seen, this style of war is not always successful. The United States must reconcile the role of information and technology in the way it conducts war. Above all, the limitations of information and technology need to be recognized and assessed in determining future structures. In addition, the planning of war must recognize that the application of overwhelming force may not always be achieved. The United States needs to reconcile the utility of the center of gravity concept against the various definitions and service perceptions. This would enhance planning by resurfacing this lost analytical tool. It would also improve the American way of war.

NOTES

[1] W.B. Cunningham and M.M. Taylor, "Information for Battle Command," Military Review 74 (November 1994): 83.

[2] Morris J. Boyd and Michael Woodgerd. "Force XXI Operations," Military Review 74 (November 1994): 19.

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